

Stress fracture of the femoral component in total knee replacement: a report of 3 cases

M. Wada¹, S. Imura¹, A. Bo¹, H. Baba¹, T. Miyazaki²

¹ Department of Orthopaedic Surgery, Fukui Medical School, Fukui, Japan

² Department of Orthopaedic Surgery, Yatsuo General Hospital, Toyama, Japan

Accepted: 2 July 1996

Summary. *We report 3 cases of stress fracture of the femoral component (small size Whiteside Ortholoc II) in total knee replacements which occurred at 32, 52, and 73 months after operation. The site was at the junction between the medial posterior bevelled surface and the posterior flange. The most likely cause of failure is due to the thinness of the metal at this point.*

Résumé. *Nous avons relevé trois cas de fractures par fatigue sur un élément fémoral survenus 32 mois, 52 mois et 73 mois après une arthroplastie totale du genou. Les implants utilisés étaient des genoux entiers Whiteside Ortholoc II. Toutes les fractures se sont produites entre la surface postérieure intermédiaire en biseau et la surface postérieure de l'élément fémoral. La principale cause d'échec vient vraisemblablement de la minceur du métal sur la partie cassée de l'implant.*

Introduction

There have been few reports of the fracture of a femoral component following unicompartmental knee arthroplasty [1, 3, 4]. In two, the fracture occurred just anterior or posterior to the stem which is the centre of the forces applied during normal physical activity.

Reprint requests to: M. Wada, Department of Orthopaedic Surgery, Fukui Medical School, Shimaizuki 23, Matsuoka, Fukui 910-11, Japan

Stress fractures of the femoral component after non-hinged total knee replacement are rare. Cook and Thomas described a single case [2] and Whiteside et al reported 32 cases after cementless total knee replacement [5].

Case reports

Case 1

A woman, 71 years of age and body weight 45 kg, had an Ortholoc II (Dow Corning Wright, Arlington, TN, USA) prosthesis implanted with bone cement in her left knee in 1987. The small size femoral component with a double bead layer was used. She also underwent total replacement of her right knee with the same size of Ortholoc II within one year.

Thirty-two months after the first operation, her left knee suddenly became painful and radiographs showed a fracture of the femoral component (Fig. 1) between the posterior bevelled surface and the distal flange of the medial implant. The cement mantle was approximately 1 mm thick. Scanning electron microscopy showed signs of a fatigue fracture.

Case 2

A woman, 72 years of age and weight 43 kg, had an Ortholoc II implanted without cement in her right knee in 1990. The small size femoral component with a double bead layer was used. Two years later, her left knee was replaced with an uncemented total knee (Yoshino-Shoji IV, Warsaw, IN, USA).

Fifty-two months after the first operation, she developed pain in her right knee. Radiographs showed a fracture of the femoral component (Fig. 2) at the same site as in case 1. There were loose beads from the porous layer around the implant. There was no bony ingrowth on the porous surface.

Case 3

A woman, 62 years of age and weight 48 kg, had an uncemented Ortholoc II implanted in her left knee in 1988. The small femoral component with a double bead layer was used.

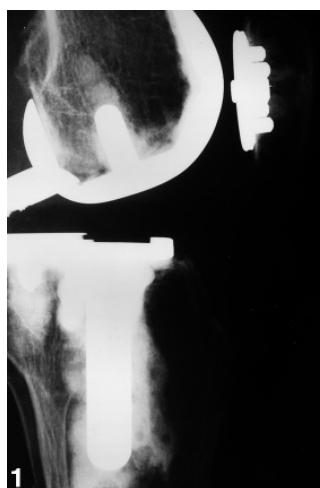
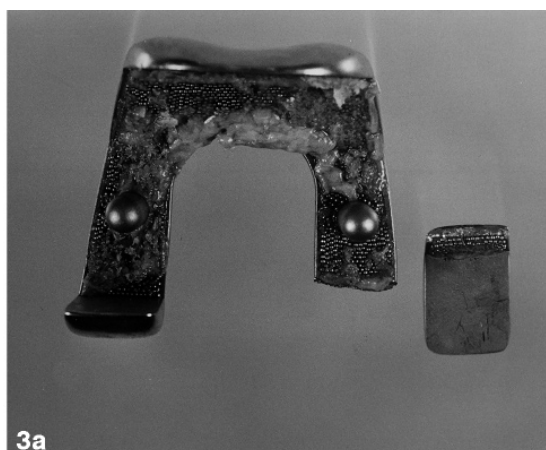


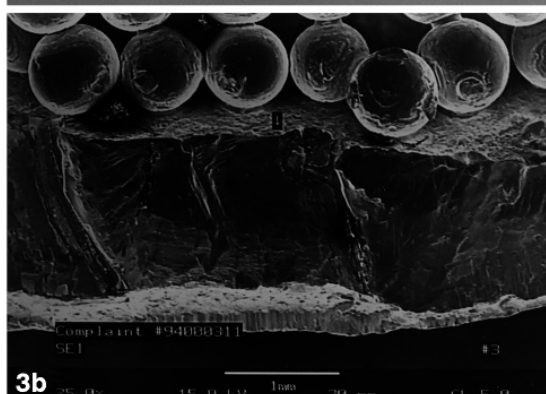
Fig. 1. Case 1. Lateral radiograph showing a fracture of the femoral component



Fig. 2. Case 2. The component is broken and loose beads are present around the implant



3a



3b

Fig. 3. Case 3. **a** The femoral component is fractured at the junction of the bevelled area and the posterior flange. **b** Scanning electron microscopy showing a stress fracture

Ten years earlier, she had received a cemented total knee replacement (Insall-Burstein II, Warsaw, IN, USA) in the right knee.

Seventy-three months after the second operation, she suddenly developed pain in her left knee. The femoral component had fractured (Fig. 3 a) at the same site as in cases 1 and 2. As in case 2, bony ingrowth had not occurred and loose beads were scattered around the implant. Scanning electron microscopy showed a typical stress fracture (Fig. 3 b).

Discussion

The implant in these 3 cases was the Ortholoc II total knee small size femoral component with a double bead coated layer. Failure occurred at the junction between the bevelled surfaces and the posterior flange. Scanning electron microscopy showed a stress fracture arising from the inner surface at this junction.

The thickness of the small size femoral component of the Ortholoc II is only 3 mm which is significantly less than that of any other implant available. This is the critical factor responsible for these failures [5]. In addition, the sintering process of the double beads makes the implant weaker [2]. In our cases, the fixation of the porous layer to bone was not well achieved and may have led to

stresses localised to the junction between the bevelled surface and the posterior flange.

Although our patients were not overweight, our failure rate of 3.3% in the 92 small components we have used was higher than that reported by Whiteside (0.82% in 852 small components) [5]. In his cases failure of the component was limited to the first 52 months after operation and the survival rate reached a plateau after the first 3 years. Our cases 2 and 3 failed at 52 and 73 months respectively.

References

1. Cameron HU, Welsh RP (1990) Fracture of the femoral component in unicompartmental total knee arthroplasty. *J Arthroplasty* 5: 315–317
2. Cook SD, Thomas KA (1991) Fatigue failure of non-cemented porous-coated implants: a retrieved study. *J Bone Joint Surg [Br]* 73: 20–24
3. Moreland JR (1986) Fracture of a unicompartmental knee replacement femoral component. *Clin Orthop* 206: 166–168
4. Sandborn PM, Cook SD, Kester MA, Haddad RJ Jr (1987) Fatigue failure of the femoral component of a unicompartmental knee. *Clin Orthop* 222: 249–254
5. Whiteside LA, Fosco DR, Brooks JG Jr (1993) Fracture of the femoral component in cementless total knee arthroplasty. *Clin Orthop* 286: 71–77